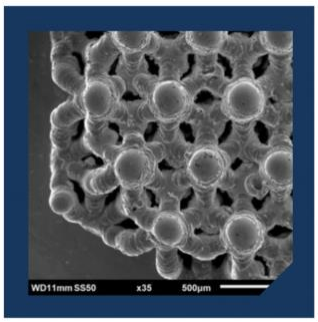
3D METAL PRINTING POST PROCESSING

15 november 2018

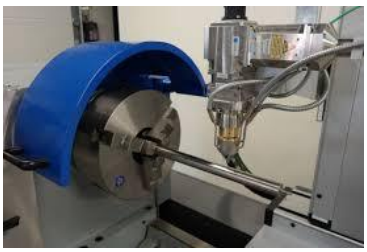
Vereniging
Industrieel
Oppervlaktebehandelend
Nederland

3D METAL PRINTING

3D multi metal printing

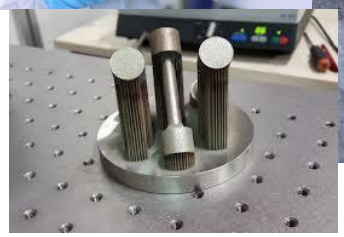


Laser Cladding



Selective Laser Melting SLM

3D METAL PRINTING SLM



BASIS SLM MATERIAL

3D Additive Manufacturing inventarisation			
	OEM HIGH TECH	OEM MEDICAL	OEM MOBILITY
How important is dimension stability (tolerances if known)?	Most of the printed parts are machine afterwards. Reproduction is more important than initial accuracy to ensure references for machining.	Very important in our case, dimension stability will influence medical image quality.	Very important. Most industrial applications do not work without sticking to tolerances.
What kind of material do you want to use (Titanium, aluminium, stainless steel,	All, priority Ti, SS, Alu, high temperature materials.	We use Tungsten.	Titanium, aluminium, Inconel steel.
Do you need multi metal solutions?	Not on our roadmap yet as it seems not to be available in the next years, but yes, interesting.	Not yet.	Currently no multi metal solutions.
How important is it that particles are attached to the object? Is loosening a problem if particles do?	Requirement nr 1 for many parts. Particle generation must be minimized.	Yes, very annoying effect, since Tungsten particles will block X-ray which gives image quality problems.	Depending on the application but it would be better to remove the loose particles completely.
What roughness of the surface do you need (inside (cooling channels and holes) and outside)?	1,6 mu for outside and 3,2 mu for inside is ok.	Currently we haven't specified this, roughness is determined by material, building strategy and layer thickness.	Inside an Ra lower 8 would be appropriate. On the outside Ra below 3.2 would be necessary for structural applications.
Do you need a clean surface, or do you need a lubricant on the surface (piston rods)?	Yes, clean surfaces are essential. Outgassing of materials is an issue. Additives in printing material could cause outgassing (mainly in plastic printing). For the same reason lubricants are not allowed.	Yes, we need a clean surface and don't need lubricant.	Mostly clean surface.
Do you have functional wishes about the surface?		Vacuum compatible and particle free.	
Surface requirements?		Ready for glue.	
Environment conditions?		Temperature controlled within 1oC.	
Other issues		3D printing can deliver very thin wall thickness, however many surface treatment methods will cause wall breakage.	For tooling applications it would be interesting to have a look at coatings to increase wear resistance. All metals mentioned above.

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CONCLUSION INVENTARISATION

Surface roughness is rather important, however different industries do have different values.

Dimension stability (reprocebility) is an issue.

The adhesion of the particles is important.

The porosity of the workpiece must be solved when using gases, liquids or vacuum.

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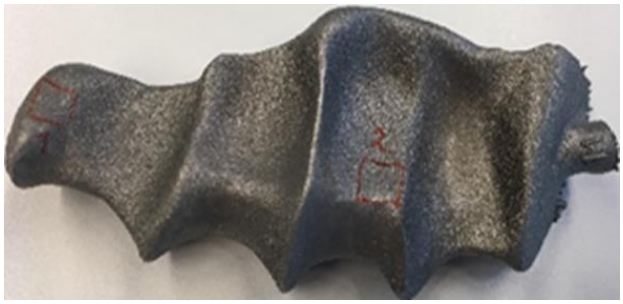
THE SAMPLES



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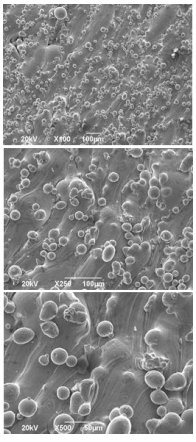
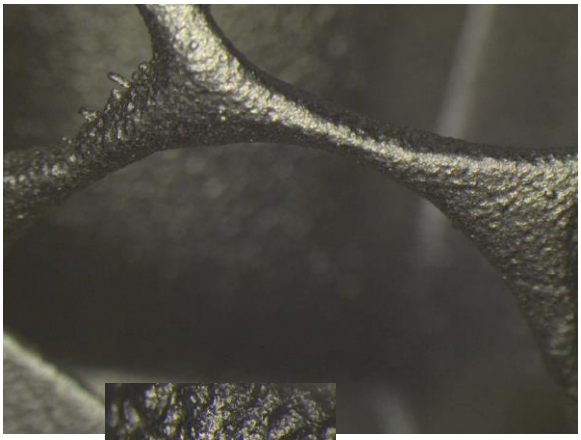
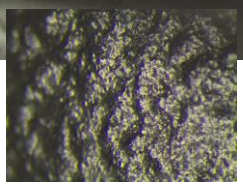
OCAS INPUT







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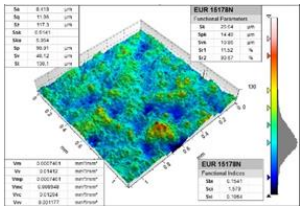
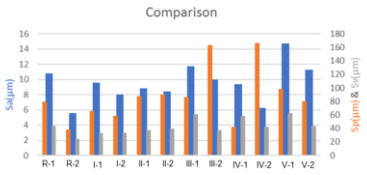
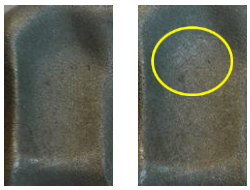


	Sa(µm)	Sq(µm)	Sz(µm)	Ssk	Sku	Sp(µm)	Sv(µm)	St(µm)
ref-1	10.767	13.464	95.940	0.190	3.395	79.441	43.626	123.068
ref-2	5.600	7.211	54.735	-0.159	3.237	38.156	24.317	62.473
Sample I-1	9.551	12.390	89.733	0.644	4.588	65.727	33.051	98.778
Sample I-2	8.006	10.143	87.451	0.163	3.557	59.012	33.357	92.369
Sample II-1	8.850	12.610	88.634	1.213	9.067	87.914	37.536	125.450
Sample II-2	8.418	11.060	117.300	0.514	5.054	90.010	40.120	130.100
Sample III-1	11.750	14.899	123.598	0.199	4.063	86.600	61.283	147.883
Sample III-2	10.001	16.316	185.277	3.639	28.290	163.237	37.754	200.991
Sample IV-1	9.394	12.135	96.076	-0.364	4.001	42.245	58.207	100.452
Sample IV-2	6.233	8.834	190.447	1.551	20.607	166.806	41.907	208.713
Sample V-1	14.737	19.159	139.132	0.497	4.401	98.438	62.950	161.388
Sample V-2	11.237	15.129	99.945	0.856	5.726	79.849	43.376	123.225





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CONCLUSIONS TILL NOW

- Peaks are difficult to tacle.
- An etching process is not the right process.
- A galvanic process (metallisation) is difficult due to dimension tolerances.
- A silicate paint is not the end solution.
- Due to a lack of interest a difficult process. How to proceed?

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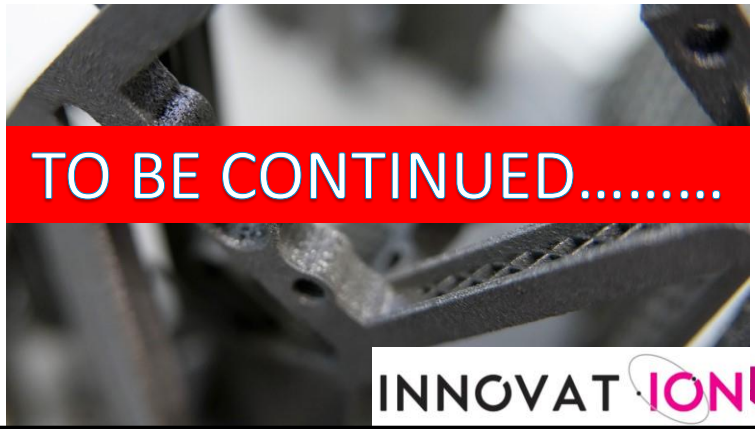
NEXT STEP

11/2018: START R&D PROJECT WORLD CLASS 3D METAL PRINTING, APPLICATIONS READY FOR MARKET.

https://3dprintmagazine.eu/vereniging-ion-start-4-jarig-project-3d-metaalprinten/



INNOVAT ION Vereniging Industrieel Oppervlaktebehandelend Nederland